EXECUTIVE SUMMARY

This report documents a review of the criticality safety program at the Plutonium Finishing Plant (PFP) conducted March 30 – April 3, 1998. The review focused on the B&W Hanford Company's (BWHC) nuclear criticality safety (NCS) program for PFP and encompassed the significant interfaces with Fluor Daniel Northwest (FDNW), Fluor Daniel Hanford (FDH), Dyncorp, Exitech and DOE Richland (DOE-RL). The NCS program was evaluated according to a comprehensive Review Plan developed by the Team (see Appendix A). The Review Plan was derived from ANSI/ANS-8.19, *Administrative Practices for Nuclear Criticality Safety*, related ANSI/ANS-8 series standards, DOE Order 5480.24, and DOE Policies 450.4 and 450.5. This review was performed at the request of the DOE-RL Assistant Manager for Facility Transition as part of line management's preparations for restarting transition operations at PFP. DOE-RL is to be commended for their continuing interest in the criticality safety program at PFP as demonstrated by requesting this review.

One of the current missions of Hanford's Plutonium Finishing Plant is to process legacy residue and wastes to reduce the overall risk of storage of these fissile materials. These Transition Operations have been curtailed for the past year while management has attempted to implement improvements in the conduct of operations and in the criticality safety program. This criticality safety program review was performed in advance of the Phase 2 Transition Operations Operational Readiness Review (ORR). Phase 2 operations include thermal stabilization and can handling operations.

The Team found that the criticality safety evaluation report (CSER) for PFP Glovebox HC-21A does not provide a safety basis for moderated plutonium compounds in the glovebox. This CSER (CSER-96-023[1]) authorizes 15 kg of potentially optimally moderated Pu compounds in a glovebox, which under credible conditions could be critical. This CSER permits operating procedures which, when implemented, could achieve a critical mass in the glovebox. The criticality prevention specification (CPS) controlling the glovebox fortuitously establishes more conservative limits than those allowed by the CSER. This conservatism was imposed by an experienced criticality safety representative (CSR) who has recently departed PFP. This failure to provide a double contingent safety basis was not identified by the qualified Peer Reviewer for FDNW, the BWHC criticality safety representative, BWHC operations management, DOE Facility Representatives, or the DOE criticality safety subject matter expert. It was only after lengthy discussions with the Team that a qualified FDNW Peer Reviewer acknowledged the flawed safety basis. BWHC management then promptly made proper notifications and posted the glovebox.

The Team identified three Concerns that contributed to the development, approval and implementation of an unsafe CSER at PFP. Resolving these Concerns is necessary to protect safety at PFP and to prevent recurrence of similar events in the future.

Concerns

1. FDH does not have a centralized criticality safety function staffed with subject matter experts that define requirements and oversee subcontractor criticality safety programs. FDH Nuclear Safety does not have the requirements defined and the contract language established to assure that only trained, qualified criticality safety engineers familiar with Hanford facilities will be selected. Furthermore, the Team found that FDH Nuclear Safety does not have the resources to define such a program by the end of FY98, when the exclusivity clause with FDNW is scheduled to expire.
2. DOE RL does not provide performance expectations to FDH and monitor the implementation of the PFP criticality safety program with subject matter experts with the necessary frequency and depth to verify performance.
3. FDNW does not demonstrate the capability to develop PFP CSERs that correctly identify contingencies and assure that operations will remain subcritical under all normal and credible abnormal events.

Fundamental problems exist with the FDH management of the NCS program in that FDH is not fully performing the NCS functions committed to in its procedures provided to DOE-RL. FDH Nuclear Safety is staffed with one half-time engineer who is not a criticality safety specialist. Funding for Nuclear Safety has been reduced to the point that all that is accomplished for NCS is maintenance and revision of the HNF-PRO procedures. Site-wide

guidance on the training, qualification and professional development of criticality safety engineers has not been issued by FDH. FDH relies on the biennial Facility Evaluation Board (FEB) to provide management feedback on the criticality safety program at PFP. The FEB treats criticality safety as one sub-element of Engineering that is only one of ten major areas that are covered. FDNW provides criticality safety subject matter experts to assist FDH Nuclear Safety with some limited tasks and to participate on the FEB. The FEB does not review CSERs. FDH requires a consistency review of CSERs by BWHC's nuclear safety organization. The only technical peer review of CSERs is performed internally by FDNW. In the case of CSER-96-023 neither review was effective. The FEB does not review the PFP with sufficient frequency and depth to detect deficiencies in CSERs and postings. Definition of site-wide roles and responsibilities for criticality safety engineers at Hanford has not been issued by FDH.

The Team found during interviews with DOE-RL Quality, Safety, and Health (QSH) and Assistant Manager for Facility Transition (AMF) management and staff that performance measures for criticality safety have not been established with FDH. DOE-RL is not holding FDH accountable for the Criticality Safety Program.

DOE-RL does not monitor the PFP criticality safety program with the frequency or depth required to verify performance. The DOE-RL Functions, Responsibilities, and Authorities Manual (FRAM) commits DOE-RL to monitor contractor preparation of criticality safety analyses and the contractor criticality safety program, and establish performance indicators and incentives. DOE-RL did not review the CSER 96-023 until the Team brought it to their attention. Facility Representatives assigned to the Assistant Manager for Facility Transition perform routine surveillances and assessments of PFP. The Facility Representatives have criticality safety training commensurate with their responsibilities but not the knowledge of the physics of criticality, codes, regulations, guides, and criticality safety practices needed to assess the overall criticality safety program of PFP. The criticality safety subject matter expert (SME) reporting to the DOE-RL Quality, Safety, and Health (QSH) organization performs informal reviews of the PFP criticality program. However, neither the ESH SME nor the Facility Representatives regularly review the CSERs that form the PFP authorization basis. Furthermore, the Facility Representatives do not have the background to perform such a review. The Team found that DOE-RL has not established criticality safety performance measures. The Team recommends that DOE-RL utilize criticality safety SMEs to review CSERs, assist the Facility Representatives in verifying implementation of the criticality safety program, and develop performance measures.

The Team is concerned about the ability of FDNW specifically, and in general, the subcontracting practice of purchasing CSERs via task order without involving the criticality safety engineers in the implementation of the safety basis established by the CSERs. FDNW currently employs the majority of active criticality safety engineers with PFP experience. The Team found that FDNW has a few highly qualified criticality safety engineers on staff. However, the FDNW qualification program for criticality safety engineers does not have the curricula and testing to assure development of necessary criticality expertise. FDNW criticality safety engineers confuse controls with contingencies in CSERs which may result in underreporting of infractions by BWHC when implementing the graded infraction program. Members of the FDNW staff stated that conformance with the ANSI/ANS Standards and to HNF-PRO procedures is not required of FDNW. FDH does not ensure that FDNW criticality safety staff supporting PFP are familiar with operations. Complicating these problems is the fact that FDNW is an enterprise company. The goal of an enterprise company is to become economically independent of Hanford.

The team found that BWHC management has implemented many elements of a sound criticality safety program. Line management and supervision demonstrated ownership, awareness, and involvement in criticality safety. The capabilities of the current CSR and the CSR-trainee are strong points of the program. The lone CSR at PFP has been tasked with performing almost all the nuclear criticality safety staff responsibilities specified in ANSI/ANS-8.19 with the exception of producing CSERs. BWHC management was responsive to the December 1997 DOE review[2] and is working to resolve weaknesses in the implementation of the new initiatives, primarily with the graded infraction program and the utilization of the criticality safety engineering staff. As the effective utilization of FDNW criticality safety engineers (CSEs) improves, the excessive responsibility assigned to the CSR should be reduced. The synergy between the CSR and CSE should yield a stronger nuclear criticality safety program at PFP. Given the limited budget

and technical staff and the contractual and oversight environment within which PFP has been forced to operate, BWHC has made a good faith attempt to implement a sound criticality safety program. However, BWHC needs to better utilize the CSE to fulfill the responsibilities of the NCS staff according to ANSI/ANS-8.19. BWHC buys CSERs from FDNW on a task order basis, but may not buy "safety" when the CSE is not familiar with PFP. The CSE does not ensure implementation of limits and controls or resolution of infractions, nor do they oversee the overall rigor of the program.

The Team strongly recommends DOE-RL to require a complete technical review of Phase 2 CSERs, criticality prevention specifications (CPSs), and postings prior to approving restart. The Team recommends that consideration be given to extending the exclusivity clause for FDNW in the absence of effective criticality safety programs at DOE-RL and FDH. Even with the noted deficiencies, FDNW does have some technical staff with the demonstrated ability and PFP experience to support BWHC. DOE-RL, FDH, and BWHC should partner to ensure that FDNW provides the best available criticality safety engineers to PFP in the near term until specific guidance is developed by FDH to assure the necessary technical support to PFP in the longer term. The remainder of the Team's recommendations may be found in Appendix C.

Overall the Team found the PFP criticality safety program to be deficient with respect to DOE Orders and ANSI/ANS-8.19 primarily in the oversight organizations and the subcontractor providing criticality safety support to BWHC. More importantly, the Team is concerned about the criticality safety bases supporting planned PFP operations and recommends these be reviewed independently and revised as needed prior to authorizing restart.